OUR PROCESS - ADVANCED AERATION

Bio-Bubble specialise in the development and supply of High Quality Wastewater & Sludge Treatment systems. Research with a strong emphasis on the environment led to the development of Advanced Aeration which has made a major impact not only with the impressively high and stable effluent quality the process effortlessly yields, but also with a remarkable ability to provide high stabilisation and significant reduction to sludge waste production.



> “ a process that imparts treatment to both **effluent** and **sludge** within a single reactor, producing a stable **high quality** effluent discharge whilst **reducing** and stabilising sludge waste production and **reducing** both carbon emissions and overall **energy** usage ”

Advanced Aeration has demonstrated a capacity to produce a final effluent quality better than 10: 15: 02 (BOD: Suspended Solids: Ammonia) in addition to reducing sludge waste production on average by 90%. No other biological process has successfully emulated this. Furthermore, Bio-Bubble Sludge Thickening can produce sludge for disposal to agriculture and can meet the requirements of the enhanced treatment specified within the “Safe Sludge Matrix”, which surpasses the conditions of the EU Sewage Sludge Directive [86-278-EEC].

A significant and noteworthy emphasis as all of the above can be achieved using far less energy and power than conventional systems, with lower requirements for operational tasks and asset maintenance, and without chemical additives.

ADVANCED AERATION

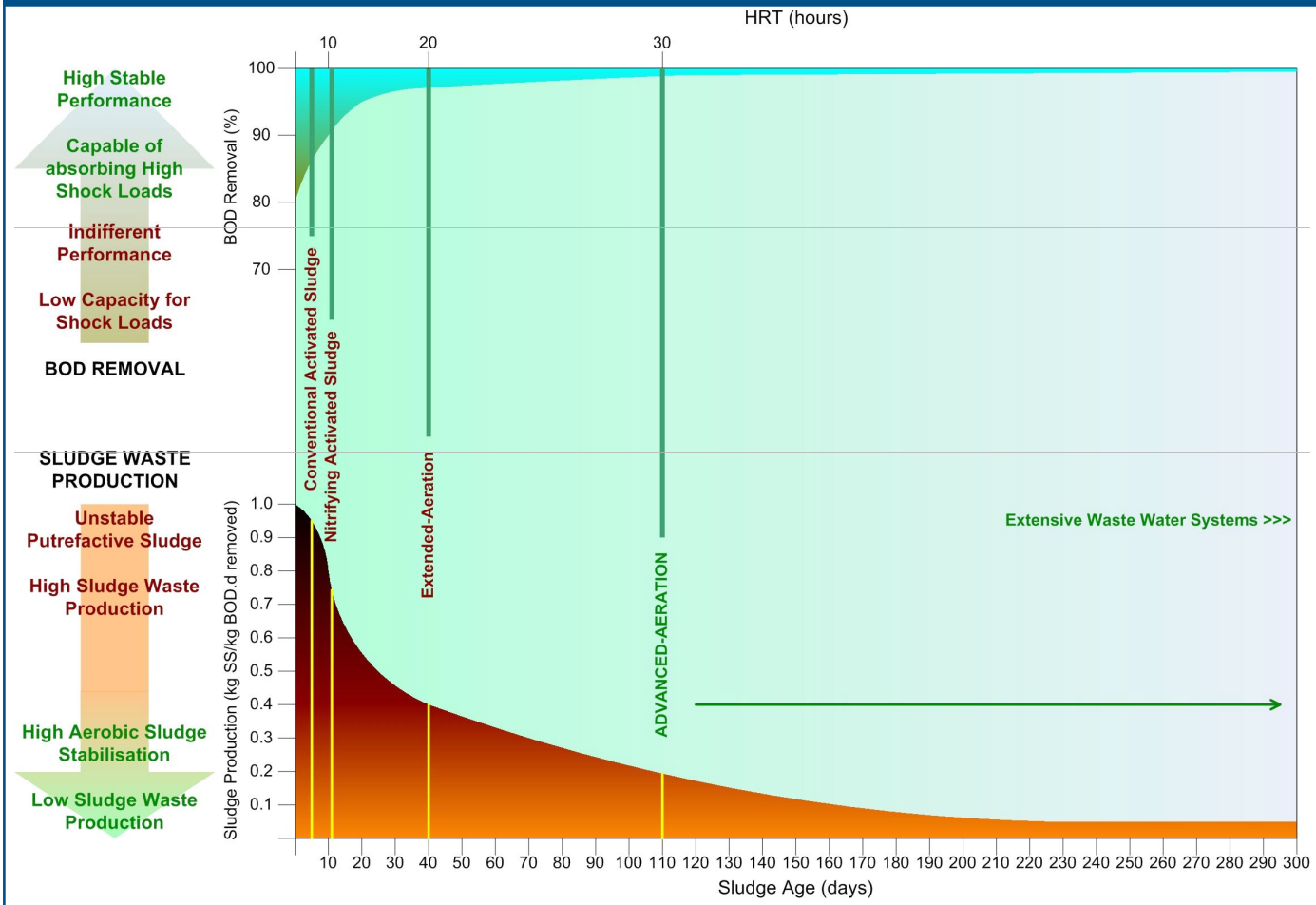
Wastewater & Sludge Treatment Solutions

LOWEST SLUDGE PRODUCTION IN THE INDUSTRY

Although the process requires larger basins than the intensified design of other systems, Bio-Bubble have succeeded with finding the most favourable balance to allow the system to be installed within the confines of urban waste water treatment works. Moreover, the application of Bio-Bubble Advanced Aeration Technology will in most cases reduce the overall footprint.

The graph below illustrates the perception of Advanced Aeration with activated sludge processes and exemplifies how a high stability can be achieved with both effluent undergoing treatment and the sludge being produced from the biological process.

ADVANCED AERATION VS CONVENTIONAL SLUDGE PROCESSES



ACTIVATED SLUDGE PROCESS	SLUDGE AGE (days)	SLUDGE PRODUCTION per Kg BOD Removed (kg SS/kg BOD d)	INERT SOLIDS (%)
Conventional	5	0.8	0.5
Nitrifying	11	0.6	2.0
Extended Aeration	40	0.4	5.0
Advanced Aeration	>100	0.2 - 0.05	>60.0

Details from the above graph are included within the table. This depicts the percentage of volatile sludge converted into an inert solid residue through endogenous decay by the different processes.

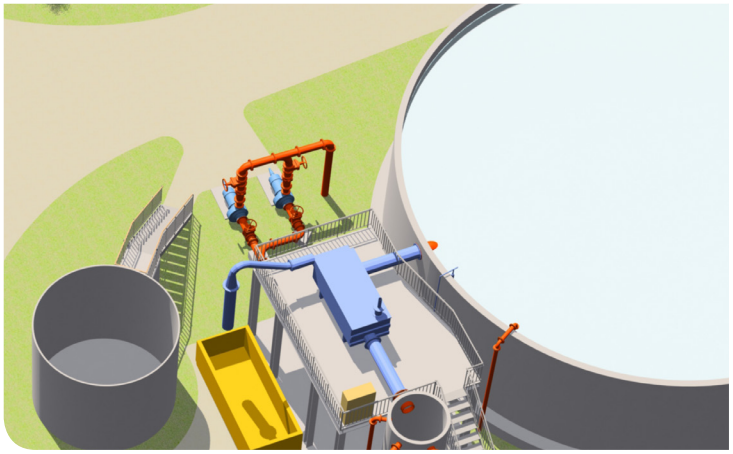
LOWEST OVERALL CARBON FOOTPRINT

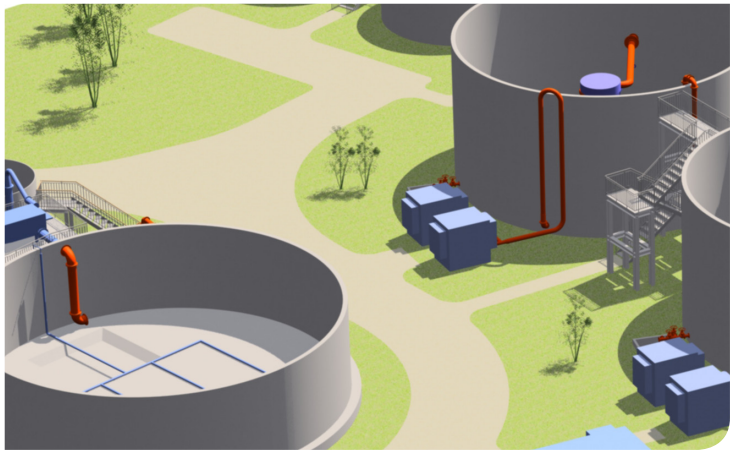
This dynamic conversion of volatile matter to solid residue improves sludge stability and significantly reduces the volume of sludge waste. Additionally, the long sludge age of Advanced Aeration has demonstrated an ability to further reduce suspended solids through a combination of extended biological activity, oxidation, erosion and solvent reaction from the long submerged retention as well as the agitation aeration and anoxic conditions the solids are subjected to.



90% less sludge waste

70% less energy consumption





During settlement the inert solid residue will increase the sludge dry solid content to around 2.5 to 3 %. Average sludge production from an Advanced Aeration system is 0.1 kg SS/kg BOD d. There are numerous Bio-Bubble installations that achieve further reductions to 0.05 kg SS/kg BOD d F/M ratios of Advanced Aeration systems are around 0.03 kg BOD/ kg MLSS or lower. This promotes very favourable conditions to stimulate a healthy, naturally selected micro-organism proliferation. An established plant will operate with high efficiency capable of producing a guaranteed final effluent quality of 15: 10: 02 (TSS: BOD: NH +-N), which in essence is straightforward at 95 % compliance with an overall respective quality of 05: 03: 0.5. This allows higher consents to be applied with little or no requirement for tertiary treatment. The application of “true SBR” technology with Advanced-Aeration also imposes optimum selective pressures and shift patterns for biological nutrient removal (BNR). Where required, minimum adjustments to existing works can be undertaken to achieve nutrient removal rates of < 1.0 mg/l NH3-N: < 1.0 mg/l TN: < 1.0 mg/l TP with overall 95 % compliance.

A further advantage of a long sludge age also extends to a significant reduction in pathogenic bacteria. Typically, sludge removed from an Advanced Aeration system will have none to negligible pathogen or virus numbers and, by transferring the sludge to a Bio-Bubble Sludge Thickener; the sludge can be treated to meet the most stringent UK and EU standards for disposal to agriculture.

Energy consumption is low at around 1.5 kW/ kg BOD5 removed and fits comfortably within the capacity of other processes. When plant size and energy utilisation has been considered along with the sludge reduction and odourless treatment capabilities of the process, it becomes apparent that the overall Energy Input and Cost Analysis can anticipate reductions of up to 70 % when compared to conventional EU effluent treatment and sludge disposal routes; that is from waste water and sludge treatment, sludge production, through to sludge thickening and final disposal routes.

There are several hundred Bio-Bubble Advanced Aeration systems in service and, a number of UK Water Utilities now reap the benefits of the process. Anglian Water has over fifteen systems installed - several being used for sensitive area discharges. Their confidence has led to the allocation of future installations being projected.

One installation at Portglenone WwTW for Water Service Northern Ireland demonstrated its superior ability when an excessively high polluting load entered the works. This took place over three days in April 2005, peaking to PE loads of 10,343 for BOD, 24,692 for COD and 30,861 for TSS, within a plant designed for 3,140 PE. During and after the pollution incident, the process remained well inside consent limits with a one-off worst case peak of 7 mg/l: 33 mg/l: 0.2 mg/l (BOD: TSS: NH3-N). An increase to the volume of sludge produced was noticeable; however, the total sludge production remained well below the volumes produced from conventional systems operating with a 3,000 PE loading.







ADVANCED AERATION

UVDB UTILITIES PREQUALIFICATION SCHEME Supplier Number: 77131

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The National Energy Efficiency Awards

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